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Country Economics Department
The World Bank
February 1993
WPS 1082

What Do Governments Buy?

The Composition of Public Spending and Economic Performance

Shantayanan Devarajan
Vinaya Swaroop
and
Heng-fu Zou

The traditional views that public capital spending strengthens economic growth and current spending does not are not borne out by experience in developing countries. In fact, the only category of public spending associated with higher economic growth is current spending — although spending on preventive care and "other education" has some positive effect.

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This paper — a product of the Public Economics Division, Country Economics Department — is part of a larger effort in the department to analyze public expenditure policies in developing countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Carlina Jones, room N10-063, extension 37699 (February 1993, 40 pages).

Devarajan, Swaroop, and Zou develop a simple analytical framework that shows how the composition of public spending affects economic growth.

Distinguishing between productive and unproductive government spending (that which complements private sector productivity and that which does not), they show that increasing the share of productive spending leads to a higher steady-state economic growth rate.

They use data from 69 developing countries over 20 years to determine which components of public spending are productive. They find that an increase in the share of current spending has positive and statistically significant effects on growth.

Otherwise, the news is mainly negative. The relationship between the capital component of public spending and per capita growth is negative. The same is true of the share of spending on transport and communications. The shares spent on health and education have no significant impact, although parts of those shares — the parts spent on preventive care and "other education" — do.

These results raise the question whether public spending actually leads to a flow of public goods and services.

What Do Governments Buy?
The Composition of Public Expenditure and Economic Performance

by

Shantayanan Devarajan
Vinaya Swaroop
Heng-fu Zou*

*Public Economics Division, Country Economics Department, World Bank. We are indebted to Min Zhu for exceptionally able research assistance. We received helpful comments from Alberto Alesina, Gerry Helleiner, Manny Jimenez, Lant Pritchett, Mike Stevens, Mike Walton, and seminar participants at the World Bank and at a conference on "Africa: From Stabilization to Growth," held in Marstrand, Sweden.

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1. Introduction

Governments in developing countries spend an average of 26 percent of GDP on goods and services, a figure which has risen by eight percentage points over the last fifteen years (World Bank [1991]). The magnitude and growth of this figure has prompted a fair amount of research on the relationship between the size of government and economic growth[1]. Much less is known about how the *composition* of public expenditure affects a country's growth rate[2]. For at least three reasons, this question is becoming increasingly important. First, after a decade of fiscal adjustment, during which many of the "white elephants" in government budgets were weeded out, some developing countries are faced with hard choices when undertaking further fiscal restraint. Which component of public expenditure should be cut? Health? Education? Infrastructure? Defense? Before taking a decision, policymakers need to know the relative contributions of these different components to the country's economic performance. Second, the World Bank periodically undertakes Public Expenditure Reviews of its client countries where, among other things, the mix of public expenditures is evaluated. A systematic analysis of how this mix affects economic growth would lend much-needed support to these evaluations. Third, reviews of the experience with structural adjustment have shown that adjusting countries have followed a different composition of public expenditure from non-adjusting countries (see World Bank [1992]). What are the implications of this difference for the future prospects of these countries? The purpose of this paper, therefore, is to shed light on the relationship

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[1]For a survey, see Lindauer and Velenchik [1991].

[2]The only systematic study is Diamond [1989].

between the composition of public expenditure and economic growth.

Before proceeding, we note that governments undertake expenditures to pursue a variety of goals, only one of which may be an increase in per-capita income. We focus on growth because (i) inasmuch as growth is one of the objectives of a government, it is useful to know the contribution of different components of expenditure to this objective as a means of assessing the cost of pursuing other goals; and (ii) per-capita income is easier to measure than some of the other objectives of government.

Neither economic theory nor empirical evidence provides clear-cut answers to the question of how the composition of public expenditure affects economic growth. The theory develops a rationale for government provision of goods and services based on the failure of markets to provide public goods, internalize externalities and cover costs when there are significant economies of scale. Furthermore, when there is a failure in one market, government intervention in a related market can be justified. Sound as they are, these theoretical notions do not translate easily into operational rules about which component of public expenditure to be cut. We need to know the *relative* contribution of each component to allocative efficiency before deciding on which to reduce.

On the empirical front, a few researchers have tried linking particular components of government expenditure to private-sector productivity and economic growth but most of these efforts lack a rigorous theoretical framework and are therefore removed from the underlying rationale for government's role in the economy (Diamond [1989]). Others (Ahmed [1986], Barro [1981, 1987]) have emphasized the distinction between transitory and permanent changes in the *level* of government purchases of goods and services for explaining movements in output

among other macro variables. Much of the traditional discussion of fiscal policy centers around the financing decisions of a particular spending level. The recent revival of interest in the expenditure-composition issue (Aschauer [1989], Morrison [1991], Holtz-Eakin [1991]) has been based on theoretical models but the focus has been on the productivity of public expenditures in the United States.

In this paper, we develop (in section 2) an analytical framework which links the composition of public expenditure with economic growth. Government expenditures are divided into two categories: "productive" and "unproductive". The former complements private-sector productivity while the latter does not. We show that an increase in the share of productive expenditure leads to a higher steady-state growth rate of the economy. Next, in section 3, we estimate the model with different components of public expenditure as candidates for productive expenditure. Using data on 69 countries over twenty years, we assess whether current or capital expenditure on the one hand, and health, education, transport and communications, or defense expenditure on the other, can be classified as productive in the sense defined above. Section 4 presents our concluding remarks.

2. The Model

Since the 1960's, researchers have been looking at the relationship between fiscal policy and the economy's growth rate. The seminal contribution was by Arrow and Kurz [1970], who developed a model where consumers derive utility from private consumption as well as the public capital stock. In addition, private production benefits from the services of this capital

stock. Arrow and Kurz assumed (implicitly) that all government investment was productive. Furthermore, their model was in the neoclassical tradition where public spending only affected the economy's transitional growth rate; the steady-state growth rate remained unaltered.

The recent explosion of work on "endogenous growth" has generated a number of models linking public spending with the economy's long-term growth rate. A particularly simple version is Barro's [1990], which takes current government expenditure to be complementary with private production. Like Arrow and Kurz, Barro assumes that all government spending is productive in this sense.

Meanwhile, the empirical literature on the same topic has highlighted the distinction between productive and unproductive government spending (Landau [1983], Aschauer [1989] and Barro [1990]). A major finding of these cross-country studies is that output growth is negatively correlated with the share of government consumption in GDP. Aschauer and Barro find a positive relationship between public investment and output growth.

In this paper, we combine the above empirical observation with the earlier theoretical framework by postulating a model in which there are two types of government expenditure, productive and unproductive. A variant of Barro's [1990] model, ours expresses the difference between productive and unproductive expenditures by how they affect the aggregate production function of the economy. We assume the function has three arguments: private capital stock (k), productive government spending (g_1) and unproductive government spending (g_2)[3]. If the

[3]As is typical of these models, we leave out labor as a separate argument in the production function. If the economy in question has surplus labor, then labor is not a binding constraint and can be left out of the production function. Alternatively, we can consider the capital factor, k, to reflect human as well as physical capital.

functional form is Cobb-Douglas, then the relationship can be expressed as:

$$y = f(k, g_1, g_2) = k^{\alpha} g_1^{\beta} g_2^{\gamma} \qquad (1)$$

$$\textit{where } \alpha > 0,\ \beta > 0,\ \gamma < 0,\ \alpha + \beta + \gamma = 1.$$

The government finances its expenditure by levying a flat tax, τ, on income[4]:

$$\tau y = g_1 + g_2 \qquad (2)$$

Finally, the government chooses the share (ϕ) of total government expenditure which will go towards productive expenditure:

$$g_1 = \phi \tau y, \qquad g_2 = (1-\phi)\tau y \qquad (3)$$

Taking the government's decision as given, the single agent in the economy maximizes his welfare

$$U = \int_0^{\infty} u(c) e^{-\rho t} dt \qquad (4)$$

subject to

$$\dot{k} = (1-\tau)y - c \qquad (5)$$

where c is private consumption and ρ the rate of time preference.

In order to get analytical solutions, it is useful to specialize the utility function to the

[4]With this assumption, we are abstracting from all issues of financing government expenditures. For a lucid treatment of this issue. see Easterly [1989].

isoelastic form:

$$u(c) = \frac{c^{1-\sigma}}{1-\sigma} \tag{6}$$

For a given total level of government expenditure g ($g = g_1 + g_2$), maximizing the objective functional (4) subject to (1) and (2) yields the familiar equation for the growth rate of consumption:

$$\dot{c}/c = [(1-\tau)\phi^{\beta}(1-\phi)^{\gamma}(g/k)^{\beta+\gamma}(1-\beta-\gamma) - \rho]/\sigma \tag{7}$$

where the first term in the square brackets is the marginal productivity of capital.

Call the steady-state growth rate of consumption λ, and assume that along the steady-state growth path, the tax rate τ (and hence g/y) is constant. It follows that g/k is a constant which, by simple manipulation of (2), is given by:

$$g/k = [\tau\phi^{\beta}(1-\phi)^{\gamma}]^{1/\alpha} \tag{8}$$

The steady-state growth rate of consumption, then, is:

$$\lambda = \{\alpha(1-\tau)\phi^{\beta}(1-\phi)^{\gamma}[\tau\phi^{\beta}(1-\phi)^{\gamma}]^{(\beta+\gamma)/\alpha} - \rho\}/\sigma \tag{9}$$

From equation (9), we can derive a relationship between the steady-state growth rate, λ, and the share of government expenditure devoted to productive uses:

$$\frac{d\lambda}{d\phi} = [\beta(1-\phi)-\phi\gamma]\alpha(1-\tau)\phi^{\beta-1}(1-\phi)^{\gamma-1}(g/k)^{\beta+\gamma}/\sigma \tag{10}$$

Since γ is negative and $0 < \phi < 1$, it follows that $d\lambda/d\phi > 0$. In other words, an increase in the *share* of public expenditures going towards productive uses raises the economy's steady-state growth rate.

Note that this increase in the growth rate was achieved with no change in *total* government expenditure. In fact, the effect of an increase in the latter on the growth rate is ambiguous. To see this, consider the response of λ to an increase in τ (since $\tau = g/y$, this is equivalent to an increase in the share of government expenditure in GDP). Some manipulation leads to the result

$$\frac{d\lambda}{d\tau} > 0 \quad when \ \tau < \beta + \gamma \tag{11}$$

and conversely if $\tau > \beta + \gamma$. This is intuitive given our balanced-budget assumption: an increase in total government spending, since it has to be financed by taxes, will raise the steady-state growth rate only if the productivity of that government spending ($\beta + \gamma$) exceeds the taxes required to pay for it[5].

Clearly the model can be extended in several ways. We now consider two. First, the number of components of government expenditure can be increased from just two. This extension only makes the algebra more cumbersome without improving our knowledge of the growth process. If there are N types of government expenditure, each with its own exponent, β_i, in the production function, then the effect on growth of increasing the share of government expenditure going to the i-th component depends on the sign of β_i. If it is positive, then increasing the share raises the growth rate, and conversely if it is negative (i.e., unproductive).

Second, not all components of government expenditure affect the production function; some -- such as transfers -- are intended to affect consumer welfare. In our model, this can be incorporated by including these components in the consumer's utility function, and allowing their

[5]The ambiguity in the sign of $d\lambda/d\tau$ is confirmed by our empirical results.

exponent in the production function to be zero. The rest of the analysis follows as before.

Finally, in this model, we are taking the government's spending decisions -- on both the level and composition of expenditure -- as given, rather than deriving them from some optimizing framework. Thus, we are postulating a positive, rather than normative, approach to public spending, avoiding altogether the issue of the government's objective function.

Despite its simplicity, the model described above yields a striking conclusion: by shifting the mix of government expenditure in favor of productive activities, the economy can increase its long-run growth rate. However, the formal framework begs the question of which government expenditures are productive and which are not. In the next section, we attempt to answer this question by examining empirically how the growth performance of developing countries over time was affected by the composition of their public expenditures. We ask the data to tell us which components of expenditure contributed to faster economic growth in the long-run.

3. Empirical Analysis

Our empirical analysis focuses on the link between various components of government expenditure and economic growth in developing countries. Aschauer and Greenwood (1985), Barro (1990), and others emphasize the distinction between public goods and services that enter into the household's utility function and those that complement private sector production. The former, which they argue would include much of government consumption, are likely to have negative growth effects. While it provides utility to households, government consumption lowers

economic growth because the higher taxes needed to finance the consumption expenditure reduce returns on investments and the incentive to invest. This is confirmed by Grier and Tullock (1987). Using pooled cross-section/time-series data (115 countries including 24 OECD countries in the post-World War II period), they find a significantly negative relationship between the growth rate of real GDP and government consumption's share of GDP. By contrast, government investment expenditure, such as the provision of infrastructure services, is thought to provide the enabling environment for growth. Aschauer (1989) finds that "core infrastructure" -- streets, highways, airports, mass transit and other public capital -- has the most explanatory power for private sector productivity in the United States over the period 1949-85. For other categories of public spending, there appears to be some disagreement over whether they constitute "productive" expenditure. While Kormendi and Meguire (1985), Grier and Tullock (1987), Summers and Heston (1988) classify defense and education as government consumption and hence unproductive, Barro (1990) models them as productive. He considers spending on public education as investing in human capital. Similarly, defense spending helps protect property rights which increases the probability that an investor will receive the marginal product of capital. Based on data on 98 countries, Barro (1990) finds that an increase in resources devoted to non-productive government consumption is associated with lower per capita growth[6].

In our analysis, we refrain from an a priori classification of public expenditures into "productive" and "unproductive". Instead, we allow the data to tell us which components

[6]Based on a 119-country (developed and developing) sample, Levine and Renelt (1992) have analyzed the relationship between a diverse collection of fiscal policy indicators and growth. They find that, while there are econometric specifications that yield significant coefficient estimates between specific fiscal-policy indicators and growth, the relationship is not "robust".

conform to our definition of productive expenditure. Furthermore, since ours is a pooled, cross-section/time-series data set, we are able to capture some of the lags involved in translating productive public expenditures into economic growth. Finally, our study is unique inasmuch as it focuses exclusively on developing countries. Other studies use a mixed sample of developed and developing countries, or examine developed countries only. As we will show, the results change dramatically when the sample is restricted to developing countries.

3.1 Data and Choice of Variables

Disaggregated spending figures at the level of consolidated general government (including public sector enterprises) are required to examine the full impact of public expenditures on economic growth. Unfortunately, such data do not exist in sufficient quantity for the majority of developing countries. For this reason, the data used in this paper are confined to central government expenditures. The operations of state and local governments as well as expenditures of government owned or controlled public sector enterprises are not included[7].

The empirical analysis uses annual data on 69 countries (see the data appendix for a list of countries included) from 1970 through 1990 to examine the link between components of government expenditure and economic growth. The primary source of data on public expenditure variables is the *Government Finance Statistics (GFS)*, published annually by the International Monetary Fund. Not all observations are available for all the countries. The pooled data include total government expenditures (including the GFS classification of current and capital), expenditures for defense, education, health, and transport and communication. The

[7]As a check on our results, we repeat our analysis for the sub-sample of countries for which there are data on consolidated government expenditures (see below).

latter expenditure variable is used as a proxy for expenditure in economic infrastructure.

The model in section 2 developed a link between ϕ, the share of government expenditure devoted to productive activities, and the long-term growth rate of the economy. In the empirical analysis, we test whether the share allocated to different components of government expenditure (capital, current, health, education, defense, and transport and communication) is associated with higher growth. Thus, our key explanatory variable is the share of each component in total government expenditure. To control for level effects, we also include the share of government expenditure in GDP. This also allows us to control for the effects of financing government expenditure (which is a function of the level) on growth. In addition, we attempt to control for two other factors which determine a country's growth rate but are not necessarily linked to the composition of public expenditure: external shocks and domestic policies. The latter is measured by the premium in the parallel market for foreign exchange. To be sure, the premium captures both policy-induced distortions, such as trade restrictions, capital controls, taxes and regulation, as well as economic and political instability. Finally, the dependent variable is the five-year, forward moving average of per capita real GDP growth. The five-year forward lag is chosen to reflect the fact that public expenditures often take time before their effects on output growth can be registered. We use a moving average to eliminate short-term fluctuations induced by shifts in public expenditure (Keynesian multiplier effects).

3.2 Sample Statistics and Correlation Analysis

Before proceeding to the regression analysis, we present some sample statistics and correlation coefficients of the variables. The most striking feature of the expenditure shares is

their variation across countries. The average share of capital expenditure is about 22 percent, but it ranges between one percent (Bolivia, 1982) and 71 percent (Nepal, 1989). Within the functional classification, defense's share is the most volatile, ranging between half a percent (Botswana, 1976) and 53 percent (Oman, 1978). Despite this variability, there appears to be no systematic difference in the average expenditure shares ot slow- and fast-growing economies (Table 2). The current and capital expenditure shares are almost identical. The shares of defense is higher, and those of health and education lower in the fast-growing economies.

The comparison of averages masks how these shares vary with growth rates. A first cut at the latter question is in Table 3, which shows the correlation coefficients among the different variables. Note that current expenditure has a positive correlation, and capital a negative one, with average per-capita growth five years later. Furthermore, the correlation between transport and communication's share and per-capita GDP growth is negative and statistically significant.

In looking at either cross-section/time-series averages (Table 2) or sample correlations (Table 3), we leave out many factors that should be controlled for in order to establish any causal relationship. In the next subsection we attempt to control for some of these factors by undertaking a regression analysis of the relationship between expenditure composition and economic growth.

3.3 Regression Analysis

The method of ordinary least squares is used to estimate the following equation:

$$GGRPCGDP_{i,(t+1,t+5)} = \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 (G/TE)_{i,t} + \alpha_7 BMP_{i,t} + \alpha_8 SHOCK_{i,t} + \mu_{i,t} \quad (12)$$

where the variables are:

(i) $GRPCGDP_{i,(t+1,t+5)}$: Five year forward moving average of per capita real GDP for country *i*;

(ii) D_j : Continental dummy variables; j = 1, 2, 3, 4, and 5 correspond to East Asia, South Asia, Sub Saharan Africa, Latin America, and Europe, Middle East and North Africa respectively;

(iii) $(G/TE)_{i,t}$: A vector of public expenditure ratios for country *i*:

* NCURETE = current net of interest/total expenditure
* CAPETE = capital/total expenditure
* DEFTE = defense/total expenditure
* HLTHTE = health/total expenditure
* EDTE = education/total expenditure
* TACTE = transportation and communication/total expenditure

(iv) $BMP_{i,t}$: Premium in the parallel market for foreign exchange in country *i*; calculated as

$$BMP_{i,t} = \left(\frac{BMER_{i,t} - OER_{i,t}}{OER_{i,t}}\right) * 100 \quad (13)$$

where

$BMER_{i,t}$ = Black market exchange rate; and
$OER_{i,t}$ = Official exchange rate

(v) $SHOCK_t$: A variable constructed for each country. It measures terms of trade, interest rate shocks; calculated as

$$\begin{aligned} SHOCK_t &= (R_{t+1,t+5} - R_{t-4,t})*(DEBT/GDP)_t \\ &\quad -(Px_{t+1,t+5} - Px_{t-4,t})*(X/GDP)_t \\ &\quad +(Pm_{t+1,t+5} - Pm_{t-4,t})*(M/GDP)_t \end{aligned} \tag{14}$$

where

R = (i-dP/P)/(1+dP/P)
i = INTALL/DEBTALL
INTALL = total interest payment = INTPPG + INTPNG
INTPPG = public and public guaranteed debt interest payment
INTPNG = private and non-public guaranteed debt interest payment
= (DEBTALL-DEBTPPG)*(Annualized 3-month LIBOR + 1%)
DEBTPPG = public and public guaranteed debt
DEBTALL= total debt
dP/P = World inflation rate measured by percentage change in GDP deflator of US
Px = deflator for exports
Pm = deflator for imports
X = total export
M = total import
GDP = gross domestic product

(vi) $\mu_{i,t}$: An error term.

Table 4 contains the estimates of the above equation. Equation (4.1) shows a positive and statistically significant relationship between the five-year, forward moving average of per capita

real GDP growth[8] and the ratio of current (net of interest spending) to total expenditure.[9] A unit increase in this ratio increases the per capita real GDP growth rate by .05 percentage points. Clearly, this finding appears to be counterintuitive. For example, Barro (1989, 1990) finds that consumption expenditure (current expenditure less education and defense expenditure) is associated with *lower* per-capita growth. Furthermore, our result cuts against the grain of policy advice received by developing countries, which prescribes cutting current, rather than capital, expenditures in order to foster long-term growth. In the next sub-section, we report on various attempts to test the robustness of these results, to ensure that they are not just some statistical anomaly. Since the results appear to be robust to these tests, in the final section, we offer some interpretations about what is driving them.

The level effect of total government expenditure[10] on per-capita growth is positive but statistically insignificant. This is consistent with our model's prediction: an increase in total government spending, since it has to be financed by distortionary taxes, will raise the steady state growth rate only if the productivity of that government spending exceeds the deadweight loss associated with the taxes required to pay for it.

The relationship between the capital component of public expenditure and per capita growth rate is negative and significant as illustrated in equation (4.2). Once again this belies the standard hypothesis. Public expenditure on capital goods is supposed to add to the country's

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[8]The choice of five year forward moving average was somewhat arbitrary. Intuition suggests that lagged expenditure variables would have growth effects. We also tried seven and ten year forward moving averages of the growth variable; the results were marginally different.

[9]Even when the budgetary share of total current expenditure (i.e. including interest spending) is used, the coefficient is positive and statistically significant.

[10] This variable in the regression controls for the level effect of public expenditure as we are primarily interested in examining the link between the composition of public expenditure and economic growth.

physical capital (mainly infrastructure - roads, bridges, dams, ports, power plants etc.). Intuition suggests that the resulting stock of infrastructure capital would complement private sector productivity and hence, should have favorable growth effects.

Equation (4.3) indicates that the defense and economic infrastructure components of public spending are negatively related to per capita growth rate. Public spending in health and education also have negative coefficients though they are statistically insignificant. As economic infrastructure expenditures in general have a high proportion of capital expenditures, the finding that it has a negative correlation with per capita real GDP growth is consistent with the negative correlation found between capital expenditures and per capita growth rate in equation (4.2). However, the issue of interest is how to explain this statistically significant negative relationship given the implicit understanding that government spending on infrastructure services complements private-sector productivity.

In equation (4.4), public spending on health care is disaggregated into expenditure on (i) hospital affairs and services; (ii) clinics (providing mainly outpatient services); and (iii) public health affairs and services (mainly of a preventive nature), applied research and experimental development related to the health and medical delivery system. Notwithstanding the reduced number of observations with this specification of the health expenditure variable, we find that the coefficient of the share of expenditure on public health affairs and services, etc. is significantly positive for per capita growth. The other two components of health expenditures have statistically insignificant coefficients. A unit increase in per capita health expenditure is however, associated with a decline in the per capita growth rate. Thus, the finding indicates that neither health expenditure per capita nor total public health expenditure as a share of total

expenditure is positively related with per capita growth rate. It is the share of health expenditure on preventive care and research and development that has growth effects.

In equation (4.5), we disaggregate the education variable into expenditure on (i) administration, management, inspection, operation of pre-primary, primary and secondary education; (ii) of tertiary education; and (iii) other education. As reported in equation (4.5), this last component of education expenditure is positively and significantly related with per capita growth rate. This category of spending on education includes subsidiary services to education (transportation, food, lodging, medical and other such services to students), program units engaged in administering, supporting, or carrying out applied research into teaching methods and objectives, into learning theory and curriculum development, etc. A unit increase in the share of this category of education spending leads to an increases of 0.63 percentage points in per capita real GDP. The level of education expenditure (measured by per capita real education expenditure) has negative growth effects.

As for the other variables in the regressions, note that the black-market premium is negative and statistically significant in almost all the equations. The sign is what would be expected: the higher the premium, the more distorted the economy, the worse its growth performance. Interestingly, the shock variable is not statistically significant. It is possible that most of the contribution of this variable is being picked up by the regional dummies, which are, for the most part, statistically significant.

3.4 Alternative Specifications and Samples

Given the surprising nature of these results, especially those having to do with current

and capital expenditures, we now subject them to a series of tests, to ensure that they are not due to some statistical fluke. The tests are not formal ones. Rather, they are based on our views on possible factors which could be driving these results but were not connected with the productivity of public spending.

3.4.1 Fixed Effects Model

The regression results reported in subsection 3.3 are based on panel data with the implicit assumption that there are no individual cross-sectional effects. It is likely, however, that there are country-specific characteristics that might influence per capita growth. While the country-specific characteristics are generally difficult to measure (e.g. cultural factors), simply running pooled regression may bias the coefficient estimates. One simple way to account for country specific characteristics is to introduce country dummies. Given that we have 69 countries in the sample, this correction would result in a significant reduction in the degrees of freedom. Alternatively, we can apply the fixed-effects method which takes into account country-specific characteristics and models them as fixed effects within the country. In such a case we estimate the following individual-mean corrected regression model:

$$GGRPCGDP_{t+1,\,t+5,\,i} = \alpha_i + \beta_k X_{i,\,k,\,t} + \mu_{i,\,t} \qquad (15)$$

where the variable X consists of all the independent variables of equation (11). The computational procedure (see Hsiao, 1992) for estimating the parameters requires transforming the observed variables by subtracting out the appropriate time-series means, and then applying

the least-squares method to the transformed data.

Table 5 contains the estimates of the above equation. The issue of interest is: How do the results presented in Table 4 change when the fixed-effects method controls for the country specific characteristics? Equation (5.1) in Table 5 shows that the coefficient on the budgetary share of current expenditure (net of interest) continues to be weakly positive and statistically significant. Similarly, the coefficient on capital expenditure's share is negative and statistically significant. The most significant change is the statistical significance of the coefficient on the share of transport and communication. In all but one of four specifications, the negative relationship between transport and communications and per capita growth is statistically insignificant. Our earlier interpretation linking the sign on capital expenditure with that on transport and communications appears not to be valid. Another interesting feature of this fixed effects model is that the shock variable, which was previously insignificant, now becomes highly significant, and the black-market premium does the reverse. Evidently, the black-market premium was picking up country-specific characteristics (political instability, etc.). Once these characteristics were explicitly accounted for, the premium loses significance. By contrast, the external shock variable's role appears to have strengthened, since it now captures those determinants of growth not incorporated in the country-specific characteristics.

3.4.2 Nonlinear Specification and Other Variables

In this subsection we discuss the regression results based on other specifications of the basic model reported in equation (11). In the first instance we attempt a nonlinear specification of the model. It is possible that expenditure ratios and growth have some sort of "Laffer curve"

relationship. Intuition suggests that the budgetary share of capital expenditure will have a positive association with growth, but as this share keeps rising, decreasing returns to scale set in and eventually, the relationship between the two variables turns negative. Similarly, one can visualize that the share of current expenditure would be positively related to growth at least when the share is low. A well-paid but streamlined bureaucracy would efficiently manage public administration which in turn would complement private sector productivity. Table 6 reports the nonlinear regression model. As reported in equation (6.1), the growth rate is an increasing function of the share of current expenditure (net of interest spending) in budget and a decreasing function of the square term. While the first variable is strongly significant (t value = 2.39), the square term is insignificant at the conventional 5 percent level. There is one clear explanation of this result: Most of the data points are clustered around the positive and upward sloping part of the functional relationship. Therefore, it is likely that the linear relationship gives a better fit. The nonlinear specification for the capital expenditure ratio is reported in equation (6.2). The function attains a maximum when the ratio is around 18 percent. While the coefficient on the square term is statistically significant, the coefficient on the other variable is not. Once again these results corroborate our earlier findings reported in Table 4. In this case most of the data points cluster around the downward sloping negative part of the functional relationship.

There is always the possibility that the results obtained in Table 4 are due to certain variables left out of the regression equation. While we have attempted to include those variables we believe are important in determining growth (and consistent with the theoretical model in section 2), we present below the result of including one more variable. That variable is a proxy for the level of development of the country at the beginning of the period. Previous students

of the growth process (e.g., Chenery and Syrquin [1985]) have found this variable to be an important factor in determining the relationship between, say, openness and growth. We include it here mainly as a check on our results, rather than as part of a more elaborate model of the relationship between public expenditure and growth. The variable we use as a proxy for the level of development is the country's per-capita GDP in 1969. When this variable is included, the results reported in Table 4 remain unchanged. The variable itself has a negative sign and is statistically insignificant[11].

3.4.3 General vs. Central Government Spending

As stated earlier, our data set covers the operations of only the central government. Ideally, one would like to examine the impact of total government expenditures that includes the operations of state and local governments as well as expenditures of government owned or controlled public sector enterprises, on economic growth. This may be particularly important in the case of health and education expenditures, where in some federal systems, the bulk of these expenditures are carried out by sub-national governments. To our knowledge such *comprehensive* and *consistent* expenditure series (across countries and time) are not available. However, there are a few countries for which consolidated general government expenditures (i.e., operations of central, state and local governments) are reported in the GFS.

In order to determine whether or not including the state and local government expenditure data qualitatively and quantitatively affects our results, we do a few diagnostic tests. Of the 69 countries in our sample, there are 12 (see data appendix for the list) for which consolidated

[11]The results for this specification are not reported in the paper.

general government expenditure data are reported in the GFS. We take this sample of 12 countries to ascertain whether the expenditure ratios used in our analysis are statistically different for general government from central government in these countries. Table 7 presents the sample statistics for the expenditure ratios. In comparing the statistics for the two different levels of government, a couple of interesting facts emerge: as defense is primarily the responsibility of the central government, the ratio of defense to total expenditure decreases for the general government; the share of education expenditure is larger for the general government indicating that state and local government allocate a higher budgetary share for education. The expenditure ratios presented in Table 7 also seem to indicate that state and local governments spend more money on capital but less on current expenditure. Based on a paired *t* test, we find that all expenditure ratios but transport and communication based on general government data are statistically different (significant at 99% level) from the ratios based on central government data.[12]

To test whether or not the relationship between composition of expenditure and economic growth is different when expenditure shares based on general government data are used, we run the same regression model based on each of the two data sets. The regression results are reported in Table 8. While the signs and magnitudes of the coefficients are similar for both data sets, the coefficients are statistically insignificant. A paired *t* test, however, indicates that the difference between the coefficients is statistically insignificant. Hence, the coefficient estimates of the growth equations based on general government expenditure and central government expenditure are statistically the same.

[12]For space considerations these results are not reported. The results are available from the authors.

4. Conclusion

The purpose of this paper was to investigate the relationship between the composition of pubic expenditure and economic growth. Using a simple, analytical model, we showed how a change in the mix of public spending in favor of productive activities could lead to a higher steady-state growth rate for the economy. The empirical implementation of the model, however, yielded some surprising results. All of the standard candidates for productive expenditure -- capital, transport and communication, health and education -- had either a negative or insignificant relationship with economic growth. The only broad category which was associated with higher economic growth was current expenditure. Finally, some expenditures within the health and education sectors -- preventive care and "other education" -- had a positive coefficient in the regression with economic growth.

At least two interpretations suggest themselves. One is that our model is misspecified, or our data inaccurate, so that we are not capturing the "true" link between these components of public expenditure and growth. However, we have attempted to control for several of the factors which may affect economic growth: external shocks, policy distortions, region-specific effects, and development index. We also report a nonlinear specification for the expenditure variables. Thus, the charge of model misspecification rests on the existence of some other factor which both affects long-term economic growth and is systematically related to public expenditure composition. Similarly, while public expenditure data are notoriously poor, we have no reason to believe there are any systematic biases in them which would yield the above results. The one exception is the importance of sub-national government spending in education and health, in particular, in some of the larger, federal countries. We addressed this issue by examining the

coefficient estimates of the growth equations based on general government expenditure and central government expenditure for the countries for which data on both were available. We found them to be statistically the same.

The second interpretation is that our results reflect a problem in the link between public expenditures and outcomes. Earlier work has established that the stock of educated and healthy people, and of public infrastructure capital, are positively associated with economic growth. What we may be capturing is the fact that public *expenditures* in these sectors do not necessarily lead to increases in the stock of human and physical capital, so that the connection with economic growth is severed. One reason could be the efficiency with which public resources are used. Expenditure on capital goods does not necessarily lead to more capital goods. A second reason could be that the standard categories of public spending -- current and capital expenditure -- do not capture the difference between capital-stock-enhancing and consumption expenditures. For example, operations and maintenance expenditures often make a capital good productive, but they are classified as current expenditures. Similarly, some capital investment projects (everyone has his favorite example) end up being consumption goods for powerful members of society, rather than productivity-increasing activities. A third possibility is that governments use current expenditure to placate politically volatile groups. The attendant political stability, in turn, leads to higher economic growth. Regardless of which of these three possibilities is the reason, the basic message arising from this paper is that the traditional view of the link between the composition of public expenditures and economic growth is not borne out by the historical experience of developing countries.

Table 1

Sample Statistics for Pooled Data

(in percent)

[69 countries, 1971-90]

Variable	Observations	Mean	Std. Dev.	Maximum	Minimum
Cur/Te	1013	77.09	12.02	100.00	29.16
Cap/Te	1008	22.37	11.28	70.84	1.11
Def/Te	931	13.52	9.51	53.04	0.16
Hlth/Te	995	5.69	3.62	32.77	0.54
Edu/Te	998	14.04	5.95	34.71	1.02
Tac/Te	957	8.69	5.54	48.27	0.08
Other/Te	887	58.39	12.19	89.73	26.13

Notes:
Cur/Te = Ratio of current to total expenditure;
Cap/Te = Ratio of capital to total expenditure;
Def/Te = Ratio of defense to total expenditure;
Hlth/Te = Ratio of health to total expenditure;
Edu/Te = Ratio of education to total expenditure;
Tac/Te = Ratio of transport and communication to total expenditure;
Other/Te = Ratio of other to total expenditure.

Table 2
Economic Growth and Public Expenditure Mix
(in percent)
[Cross-section/Time-series data, 69 countries, 1971-90]

Range	Slow-Growth	Fast-Growth
Mean Growth Rate	-1.97 (163)	3.23 (146)
Te/GDP	24.76 (163)	22.85 (146)
Cure/Te	75.92 (163)	75.61 (146)
Ncure/Te	68.61 (155)	68.87 (139)
Cape/Te	24.03 (160)	24.21 (145)
Def/Te	12.75 (140)	14.92 (131)
Hlth/Te	6.33 (156)	4.87 (137)
Ed/Te	15.05 (156)	13.55 (138)
Tac/Te	10.10 (152)	8.67 (130)
Hosp/Te	5.16 (83)	2.96 (66)
Inhlth/Te	0.56 (26)	0.77 (44)
Othlth/Te	1.41 (66)	1.55 (72)
Schl/Te	8.60 (83)	8.99 (78)
Univ/Te	3.03 (82)	2.85 (76)
Othed/Te	2.42 (71)	2.65 (77)

Notes:
a) Growth rate is 5-year forward moving average of per capita real GDP.
b) Mean growth is 0.5. Fast-growth refers to the periods where growth is greater than the mean growth; Slow-growth is less than the mean growth.
c) Numbers in parentheses are observations.

Table 3
Correlation Coefficients

	GRPCGDP	*Cur/Te*	*Cap/Te*	*Def/Te*	*Edu/Te*	*Hlth/Te*	*Tac/Te*	*Other/Te*
GRPCGDP		0.043	-0.065	0.18	-0.054	-0.2	-0.14	0.04
		(0.36)	(0.18)	(0.001)	(0.26)	(0.001)	(0.006)	(0.41)
Cur/Te			-0.85	0.08	0.1	0.13	-0.38	0.006
			(0.001)	(0.01)	(0.002)	(0.001)	(0.00[illegible])	(0.87)
Cap/Te				-0.02	-0.07	-0.09	0.47	-0.12
				(0.54)	(0.03)	(0.005)	(0.001)	(0.001)
Def/Te					-0.18	-0.32	-0.08	-0.56
					(0.001)	(0.001)	(0.02)	(0.001)
Edu/Te						0.38	0.10	-0.52
						(0.001)	(0.002)	(0.001)
Hlth/Te							0.068	-0.29
							(0.003)	(0.001)
Tac/Te								-0.47
								(0.001)
Other/Te								

Note: Parenthesis indicate the level of significance required to reject the hypothesis that the Pearson correlation coefficient is zero.

Table 4
Composition of Government Expenditure and Economic Growth
{Dependent variable = GRPCGDP, 5-year forward moving average of per capita real GDP growth rate}[a]

Equation	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)	(4.6)
E. Asia	1.22	5.09	7.29	3.70	6.66	8.21
	(0.93)	(5.62)	(6.23)	(0.91)	(3.81)	(1.46)
S. Asia	1.14	4.89	5.89	2.61	7.46	7.86
	(0.92)	(6.03)	(6.46)	(0.61)	(3.96)	(1.44)
Sub Saharan Africa	-2.00	2.03	3.66	0.28	2.93	4.33
	(-1.62)	(2.63)	(3.47)	(0.09)	(1.82)	(0.81)
Latin America	-2.61	1.35	2.03	6.32	4.28	7.86
	(-2.12)	(1.93)	(2.14)	(1.93)	(2.44)	(1.59)
EMENA	-0.02	3.63	5.27	4.22	3.91	5.78
	(-0.02)	(3.46)	(3.86)	(1.26)	(2.41)	(1.05)
Te/GDP	0.016	0.003	-0.033			-0.039
	(0.80)	(0.16)	(-1.43)			(-0.46)
Ncur/Te	0.039					
	(2.91)					
Cap/Te		-0.037				
		(-2.62)				
Def/Te			-0.053	0.093	-0.053	-0.006
			(-2.27)	(1.04)	(-1.21)	(-0.06)
Hlth/Te			-0.024		-0.50	
			(-0.47)		(-2.94)	
Ed/Te			-0.021	0.017		
			(-0.62)	(0.17)		
Trc/Te			-0.145	-0.33	-0.22	-0.30
			(-5.13)	(-5.31)	(-5.11)	(-3.92)
Schl/Te					0.075	-0.02
					(0.88)	(-0.08)
Univ/Te					0.38	0.39
					(1.52)	(1.00)
Othed/Te					0.63	-0.56
					(3.64)	(-1.00)
Hosp/Te				0.29		-0.70
				(0.47)		(-1.59)
Inhlth/Te				0.02		0.02
				(0.03)		(0.02)

Table 4 (Cont'd)

Equation	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)	(4.6)
Onhlth/Te				1.03 (1.47)		1.05 (1.27)
HlthCap				-0.16 (-1.96)		
EdCap					-0.025 (-2.05)	
PvInv/Gdp	-0.038 (-1.17)	-0.037 (-1.14)				
Black	-0.013 (-3.95)	-0.014 (-4.17)	-0.010 (-2.92)	0.003 (0.12)	-0.010 (-1.54)	-0.009 (-0.31)
Shock	-0.05 (-1.48)	-0.06 (-1.70)	0.008 (0.22)	0.005 (0.04)	-0.01 (-0.13)	-0.051 (-0.33)
Adj. R-sq.	0.32	0.30	0.37	0.81	0.53	0.79
Obs.	286	297	266	54	121	54
DW	0.56	0.56	0.66	0.92	0.84	0.83

[a] t-statistics in parentheses

Table 5
Composition of Government Expenditure and Economic Growth
(Fixed-Effects Model)
{Dependent variable = GRPCGDP, 5-year forward moving average of per capita real GDP growth rate}[a]

Equation	(5.1)	(5.2)	(5.3)	(5.4)	(5.5)	(5.6)
Intercept	0.041 (0.42)	0.1 (1.04)	0.048 (0.46)	-0.11 (-0.43)	-0.023 (-0.14)	-0.15 (-0.46)
Te/GDP	0.002 (0.07)	-0.003 (-0.13)	-0.015 (-0.47)			0.035 (0.3)
Ncur/Te	0.035 (2.7)					
Cap/Te		-0.059 (-3.41)				
Def/Te			0.053 (1.42)	-0.13 (-1.23)	0.016 (0.27)	-0.11 (-0.97)
Hlth/Te			-0.013 (-0.30)		0.14 (0.62)	
Ed/Te			0.006 (0.14)	-0.16 (-1.11)		
Tac/Te			-0.037 (-1.14)	-0.14 (-1.24)	-0.04 (-0.88)	-0.13 (-1.00)
Schl/Te					0.16 (1.40)	-0.29 (-1.37)
Univ/Te					0.09 (0.45)	0.23 (0.58)
Othed/Te					0.16 (0.81)	-0.14 (-0.24)
Hosp/Te				0.75 (0.90)		0.46 (0.48)
Inhlth/Te				0.43 (0.70)		0.21 (0.26)
Othlth/Te				2.26 (2.48)		2.14 (2.06)
HlthCap				-0.39 (-3.24)		
EdCap					-0.091 (-3.88)	

Table 5 (Cont'd)

Equation	(5.1)	(5.2)	(5.3)	(5.4)	(5.5)	(5.6)
Black	0.0004	0.0005	0.001	-0.009	0.001	-0.009
	(0.44)	(0.61)	(1.00)	(-0.36)	(0.18)	(-0.33)
Shock	-0.096	-0.095	-0.12	0.017	-0.096	-0.065
	(-3.67)	(-3.67)	(-3.86)	(0.16)	(-1.78)	(-0.50)
Adj. R-sq.	0.06	0.08	0.05	0.26	0.15	0.06
Obs.	294	305	266	54	121	54
DW	0.96	1.05	1.04	0.84	1.03	1.01

[a] t-statistics in parentheses

Table 6
Composition of Government Expenditure and Economic Growth
(Nonlinear Model Specification)
{Dependent variable = GRPCGDP, 5-year forward moving average of per capita real GDP growth rate}[a]

Equation	(6.1)	(6.2)
E. Asia	-6.41	2.76
	(1.83)	(2.87)
S. Asia	-6.18	2.88
	(-1.76)	(2.87)
Sub Saharan Africa	-9.37	0.04
	(-2.69)	(0.05)
Latin America	-10.26	-1.06
	(-2.96)	(-1.2)
EMENA	-7.55	1.35
	(-2.09)	(1.09)
Te/GDP	0.02	0.008
	(0.97)	(0.41)
Ncur/Te	0.24	
	(2.39)	
(Ncur/Te)sq	-0.001	
	(-1.95)	
Cap/Te		0.11
		(1.80)
(Cap/Te)sq		-0.003
		(-2.62)
Black	-0.013	-0.014
	(-4.0)	(-4.58)
Shock	-0.048	-0.059
	(-1.37)	(-1.7)
Adj. R-sq.	0.33	0.32
Obs.	294	305
DW	0.57	0.59

[a] t-statistics in parentheses

Table 7
Sample Statistics for Central and General Government Expenditure Shares
[12 countries, 1971-90]

Variable	Observations		Mean		Std. Dev.		Maximum		Minimum	
	CC	CG	CC	CG	CC	CG	CC	CG	CC	CG
Cur/Te	184	135	79.46	76.99	12.64	14.16	98.05	97.73	47.15	45.44
Ncur/Te	184	135	70.70	68.85	12.90	14.28	91.86	93.07	35.12	32.11
Cap/Te	184	135	20.55	20.97	12.62	12.09	52.85	51.95	1.95	1.95
Def/Te	145	121	11.95	8.67	5.70	5.93	26.24	20.76	1.69	0.01
Hlth/Te	182	126	6.17	6.62	3.73	3.79	19.83	19.44	1.09	2.01
Edu/Te	182	126	11.82	13.43	5.94	3.53	24.00	24.31	1.46	6.52
Tac/Te	179	125	8.63	8.85	6.40	6.02	48.27	27.99	0.90	1.96

Notes:
a) CC = Consolidated Central Government
CG = Consolidated General Government
b) 12 countries are: Argentina, Chile, Ethiopia, Gambia, Greece, Hungary, Indonesia, India, Kenya, Malawi, Panama, Zimbabwe

Table 8
Composition of General Government Expenditure and Economic Growth
{Dependent variable = GRPCGDP, 5-year moving average per capita real GDP growth rate}[a]

Equation	(C1)[b]	(G1)[b]	(*t*-test)[c]	(C2)	(G2)	(*t*-test)	(C3)	(G3)	(*t*-test)
E. Asia	4.53	4.88	0.023	1.17	2.09	-0.286	-1.62	1.41	-0.83
	(2.25)	(2.52)		(0.53)	(0.88)		(-0.54)	(0.68)	
S. Asia	4.92	5.14	0.086	2.54	2.48	0.035	1.695	0.84	0.33
	(2.04)	(1.97)		(2.36)	(1.67)		(0.88)	(0.48)	
Sub Saharan Africa	2.92	2.52	0.11	0.28	-0.06	0.132	-6.41	-3.60	-0.55
	(0.98)	(0.75)		(0.16)	(-0.03)		(-1.46)	(-1.37)	
Latin America	4.68	4.65	0.072	2.25	1.92	0.119	-2.78	-2.01	-0.18
	(1.47)	(1.35)		(1.18)	(0.97)		(-0.83)	(-0.75)	
EMENA	0	0	0	0	0	0	0	0	0
Te/GDP	-0.025	-0.026	-0.048	-0.023	-0.02	-0.036	-0.011	-0.012	0.0087
	(-0.41)	(-0.44)		(-0.39)	(-0.35)		(-0.13)	(-0.164)	
Ncur/Te	-0.024	-0.027	0.065						
	(-0.91)	(-0.98)							
Cap/Te				0.043	0.033	0.215			
				(1.35)	(0.92)				
Def/Te							0.016	-0.086	0.89
							(0.194)	(-1.11)	
Hlth/Te							0.066	0.149	-0.32
							(0.336)	(0.91)	
Ed/Te							0.223	0.152	0.35
							(1.35)	(1.33)	
Tac/Te							0.175	0.062	1.15
							(2.17)	(1.14)	
Black	-0.014	-0.012	0.127	-0.015	-0.015	0.0	-0.0079	-0.00008	-0.345
	(-1.45)	(-0.91)		(-1.56)	(-1.19)		(-0.441)	(-0.005)	
Shock	-0.03	-0.017	-0.27	-0.046	0.018	-0.505	0.042	0.049	-0.056
	(-0.34)	(-0.18)		(-0.54)	(0.2)		(0.46)	(0.57)	
Adj. R-sq.	0.44	0.47		0.45	0.46		0.52	0.62	
Obs.	60	57		60	57		51	46	
DW	0.96	1.00		0.95	0.97		1.02	1.46	

Notes: [a] t-statistics in parentheses; [b] C= Central Government; G= General Government;
[c] *t*-Test = *t*-test for the differences between $ß_{kc}$ and $ß_{kg}$

References

Ahmed, Shagil, 1986, Temporary and permanent government spending in an open economy, *Journal of Monetary Economics*, 17, 197-224.

Arrow, Kenneth J. and Mordecai Kurz, 1970, *Public Investment, the Rate of Return and Optimal Fiscal Policy*, Baltimore: The John Hopkins.

Aschauer, David, 1989, Is government spending productive?, *Journal of Monetary Economics*, 23, 177-200.

Aschauer, David and Jeremy Greenwood, 1985, Macroeconomic effects of fiscal policy, *Carnegie-Rochester Conference Series on Public Policy*, 23, 91-138.

Barro, Robert J., 1981, Output effects of government purchases, *Journal of Political Economy*, 89, 1086-1121.

----------, 1987, Government spending, interest rates, prices, and budget deficits in the United Kingdom 1701-1918, *Journal of Monetary Economics*, 20, 221-247.

----------, 1990, Government spending in a simple model of endogenous growth, *Journal of Political Economy*, 98, S103-S125.

----------, 1991, Economic growth in a cross section of countries, *Quarterly Journal of Economics*, 106, 407-444.

Diamond, Jack, 1989, Government expenditure and economic growth: An empirical investigation, IMF Working Paper No. 89/45, Washington, D.C.

Easterly, William, 1989, Policy distortions, size of government and growth, NBER Working Paper No. 3214, December.

Grier, Kevin and Gordon Tullock, 1989, An empirical analysis of cross-national economic growth, 1951-1980, *Journal of Monetary Economics*, 24, 259-276.

Hsiao, Cheng, 1992, Analysis of panel data, *Econometric Society Monograph*, Cambridge University Press.

Holtz-Eakin, Douglas, 1991, Public-sector capital and the productivity puzzle, mimeograph, Syracuse University.

Kaufman, Danny, 1991, The forgotten rationale for policy reform: The productivity of Bank

and IFC investment projects, World Bank.

Kormendi, R. C. and P. G. Meguire, 1985, Macroeconomic determinants of growth: Cross-country evidence, *Journal of Monetary Economics*, 16, 141-164.

Landau, Daniel, 1983, Government expenditure and economic growth: A cross-country study, *Southern Economic Journal*, 49(3), pp. 783-92, January.

Levine, Ross and David Renelt, 1992, A sensitivity analysis of cross-country growth regressions, *American Economic Review*, 82 (4), 942-963.

Lindauer, David L. and Ann D. Velenchik, 1992, Government spending in developing countries: Trends, causes and determinants, *World Bank Research Observer*, 7(1), 59-78.

Morrison, Catherine and Amy E. Schwartz, 1991, State infrastructure and productive performance, mimeograph, Tufts University.

Summers, Robert and Alan Heston, 1988, A new set of international comparisons of real product and price levels: Estimates for 130 countries, *The Review of Income and Wealth*, 34, 1-25.

World Bank, 1992, *Adjustment Lending and Mobilization of Private and Public Resources for Growth*, Washington, D.C.

World Bank, 1992, *World Development Report*, Washington, D.C.

Data Appendix

Annual data on 69 developing countries (see the list below) from 1970 through 1990 were used for the empirical analysis. Several sources were used (see below the section on sources) to assemble the data base. At this point, we are still in the process of collecting additional data.

The primary source for data on government expenditure is *Government Finance Statistics (GFS)*, an annual publication of the International Monetary Fund. Ideally, we would like to have consolidated general government (including the expenditures of public sector enterprises) expenditure data to examine the full impact of public expenditures on economic growth. Unfortunately, such data do not exist in sufficient quantity for the majority of developing countries. GFS coverage is comprehensive for central government accounts but is quite restricted for the accounts of general government. For this reason, the main empirical results presented in data used in this paper are based on central government expenditures. The operations of state and local governments as well as expenditures of government owned or controlled public sector enterprises are not accounted for. Regression results based on consolidated general government (includes central, provincial and municipal) expenditures are presented in Table 8. Within the main sample of 69 countries, expenditure data on 46 countries are on consolidated central government (includes central government account, social security and extra budgetary account) and on the remaining 23 countries it only accounts for budgetary central government. Definitions of the variables used in the empirical analysis and their sources are listed in the next section.

I. Data Sources

(i) Government Finance Statistics (GFS), International Finance Statistics (IFS), and National Accounts (BESD - World Bank Economic and Social Database) - all from the International Monetary Fund.

(ii) International Currency Analysis, Inc., World Currency Yearbook, New York.

(iii) IECNA in BESD; World Development Report (WDR), 1991; World Debt Tables (WDT)- all from the World Bank.

II. Variables

GRPCGDP :	Five year forward moving average of per capita real GDP (in 1980 US dollars) Source: IFS and IECNA.
TER :	Total expenditure;
CUR :	Current expenditure;
CAP :	Capital expenditure;
DEF :	Defense expenditure;
HLTH:	Health expenditure;
EDU :	Education expenditure;
TAC :	Transportation and communication expenditure; Source: GFS.

BMP :	Premium in the parallel market for foreign exchange Source: Kaufmann, 1991
SHOCK:	A constructed variable that measures effects of terms of trade, and real interest rate changes Source: WDT, IFS, NA.
D :	Continental dummy variables; j=1,2,3,4, and 5 correspond to East Asia, South Asia, Sub Saharan Africa, Latin America, and Europe, Middle East and North Africa (EMENA) respectively Source: World Bank Classification of Country Group, 1991

III. Countries

A. Country Groups: Regional Classification

6 East Asia
6 South Asia
26 Sub Saharan Africa
20 Latin American and Caribbean
11 EMENA

B. Country Groups: Income Levels

29 Low income
31 Middle income (lower)
9 Middle income (upper)

C. Country List

Code	Name
ARG	ARGENTINA*
BGD	BANGLADESH
BOL	BOLIVIA
BWA	BOTSWANA
BRA	BRAZIL
HVO	BURKINA FASO
BUR	MYANMAR
CMR	CAMEROON
CHL	CHILE*

COL	COLOMBIA
CRI	COSTA RICA
DOM	DOMINICAN REPUBLIC
ECU	ECUADOR
EGY	EGYPT, ARAB REPUBLIC OF
SLV	EL SALVADOR
ETH	ETHIOPIA*
GMB	GAMBIA, THE*
GHA	GHANA
GRC	GREECE*
GTM	GUATEMALA
GUY	GUYANA
HND	HONDURAS
HUN	HUNGARY*
IND	INDIA*
IDN	INDONESIA*
JOR	JORDAN
KEN	KENYA*
KOR	KOREA, REPUBLIC OF
LSO	LESOTHO
LBR	LIBERIA
MWI	MALAWI*
MYS	MALAYSIA
MLI	MALI
MRT	MAURITANIA
MUS	MAURITIUS
MEX	MEXICO
MAR	MOROCCO
NPL	NEPAL
NIC	NICARAGUA
NGA	NIGERIA
OMN	OMAN
PAK	PAKISTAN
PAN	PANAMA*
PNG	PAPUA NEW GUINEA
PRY	PARAGUAY
PER	PERU
PHL	PHILIPPINES
POL	POLAND
PRT	PORTUGAL
RWA	RWANDA
SEN	SENEGAL
SLE	SIERRA LEONE
SOM	SOMALIA
ZAF	SOUTH AFRICA
LKA	SRI LANKA
SDN	SUDAN

SYR	SYRIAN ARAB REPUBLIC
TZA	TANZANIA
THA	THAILAND
TGO	TOGO
TTO	TRINIDAD AND TOBAGO
TUN	TUNISIA
TUR	TURKEY
UGA	UGANDA
URY	URUGUAY
VEN	VENEZUELA
ZAR	ZAIRE
ZMB	ZAMBIA
ZWE	ZIMBABWE*

* indicates countries for which general government expenditure is also available in the GFS.

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